

CLAIMS

1. A data transmitting apparatus, comprising:
storing means for storing a retransmittable data only;
5 retransmitting means for retransmitting a data that is
extracted from the data stored in said storing means
corresponding to a retransmission request of a receiving side;
calculating means for calculating a data round-trip time
between the receiving side and the data transmitting apparatus;

10 and

transmitting means for transmitting the data round-trip
time calculated by said calculating means to the receiving
side at a predetermined time interval.

2. The data transmitting apparatus according to claim 1,
15 wherein the retransmittable data is a data that has high
priority.

3. The data transmitting apparatus according to claim 1,
wherein said calculating means comprises:

means for measuring transmission time of a first data
20 to be transmitted to the receiving side;

means for measuring reception time of a second data
transmitted from the receiving side in response to the first
data; and

means for calculating the data round-trip time by
25 subtracting a differential time between reception time of the
first data at the receiving side and transmission time of the
second data, the differential time being included in the second

data, and the measured first data transmission time from the measured second data reception time.

4. The data transmitting apparatus according to claim 3, wherein said calculating means calculates, when the measured first data transmission time is transmitted to the receiving side and the first data transmission time is included in the second data together with the differential time, the data round-trip time using the first data transmission time included in the second data.

5. The data transmitting apparatus according to claim 1, further comprising packetizing means for packetizing the data round-trip time calculated by said calculating means together with other information to form a single packet, and wherein said transmitting means transmits the single packet formed by said packetizing means to the receiving side at a predetermined time interval.

6. The data transmitting apparatus according to claim 1, further comprising:

monitoring means for monitoring the status of data communication; and

altering means for altering the time interval at which the data round-trip time calculated by said calculating means is transmitted to the receiving side in accordance with the result of the monitoring by said monitoring means.

7. The data transmitting apparatus according to claim 1, further comprising altering means that includes means for holding the data round-trip time calculated by said calculating

means and for altering the time interval at which a present data round-trip time calculated by said calculating means is transmitted to the receiving side in accordance with a time difference between the present data round-trip time and a previous data round-trip time calculated by said calculating means.

8. A data transmitting apparatus, comprising:

storing means for storing a retransmittable data only;

retransmitting means for retransmitting a data that is extracted from the data stored in said storing means corresponding to a retransmission request of a receiving side;

measuring means for measuring a differential time between reception time of a first data transmitted from the receiving side and transmission time of a second data to be transmitted to the receiving side in response to the first data; and

transmitting means for transmitting the differential time measured by said measuring means included in the second data to the receiving side at a predetermined time interval.

9. A data receiving apparatus, comprising:

receiving means for receiving a data;

loss detecting means for detecting loss of data when the data is received by said receiving means;

playback time calculating means for calculating playback time of the data received by said receiving means;

round-trip time receiving means for receiving a data round-trip time between a transmitting side and the data

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receiving apparatus; and

retransmission request deciding means for deciding, when a lost data is detected by said loss detecting means, whether a retransmission request for the lost data is made or not based on the playback time calculated by said playback time calculating means and the data round-trip time received by said data round-trip time receiving means.

10. The data receiving apparatus according to claim 9, further comprising priority determining means for determining, when a lost data is detected by said loss detecting means, the priority of the lost data, and wherein said retransmission request deciding means decides whether the retransmission request is made or not for the lost data which is determined by said priority determining means that the priority thereof is not less than a predetermined value.

11. The data receiving apparatus according to claim 9, further comprising:

measuring means for measuring a differential time between reception time of a first data transmitted from a transmitting side and transmission time of a second data to be transmitted to the transmitting side in response to the first data; and

transmitting means for transmitting the differential time measured by said measuring means included in the second data to the transmitting side at a predetermined time interval.

12. The data receiving apparatus according to claim 9, further comprising transmission time receiving means for

receiving transmission time of the first data transmitted from the transmitting side, and wherein said transmitting means transmits the transmission time received by said transmission time receiving means together with the differential time measured by said measuring means to the transmitting side at the predetermined time interval.

13. The data receiving apparatus according to claim 9, further comprising:

storing means for storing a lower limit value and an upper limit value of the data round-trip time; and

selecting means for selecting only a data round-trip time that is within a range between the lower limit value and the upper limit value stored in said storing means from the data round-trip time received by said data round-trip time receiving means, and

wherein said retransmission request deciding means decides, when a lost data is detected by said loss detecting means, whether the retransmission request for the lost data is made or not based on the playback time calculated by said playback time calculating means and the data round-trip time selected by said selecting means.

14. The data receiving apparatus according to claim 11, further comprising altering means that includes means for holding the data round-trip time received by said data round-trip time receiving means and for altering the time interval at which the differential time measured by said measuring means is transmitted to the transmitting side in

accordance with a time difference between a present data round-trip time and a previous data round-trip time that are received by said round-trip time receiving means.

15. A data receiving apparatus, comprising:

5 calculating means for calculating a data round-trip time between a transmitting side and the data receiving apparatus by subtracting transmission time of a first data transmitted to the transmitting side and a differential time between reception time of the first data at the transmitting side and transmission time of a second data transmitted from the transmitting side, the differential time being included in the second data, from reception time of the second data;

receiving means for receiving a data;

10 loss detecting means for detecting loss of data when the data is received by said receiving means;

15 playback time calculating means for calculating playback time of the data received by said receiving means; and

20 retransmission request deciding means for deciding, when a lost data is detected by said loss detecting means, whether a retransmission request for the lost data is made or not based on the playback time calculated by said playback time calculating means and the data round-trip time calculated by said calculating means.

25 16. A base station apparatus including the data transmitting apparatus in any one of claims 1 through 8.

17. An information communication terminal apparatus

including the data receiving apparatus in any one of claims 9 through 15.

18. A mobile station apparatus including the data receiving apparatus in any one of claims 9 through 15.

5 19. A data communication system comprising a data transmitting apparatus and a data receiving apparatus,

wherein the data transmitting apparatus comprises:

storing means for storing a retransmittable data only;

10 retransmitting means for retransmitting a data that is extracted from the data stored in said storing means corresponding to a retransmission request of the data receiving apparatus;

15 calculating means for calculating a data round-trip time between the data receiving apparatus and the data transmitting apparatus; and

transmitting means for transmitting the data round-trip time calculated by said calculating means to the data receiving apparatus at a predetermined time interval, and

wherein the data receiving apparatus comprises:

20 receiving means for receiving the data transmitted from the data transmitting apparatus;

loss detecting means for detecting loss of data when the data is received by said receiving means;

25 playback time calculating means for calculating playback time of the data received by said receiving means;

round-trip time receiving means for receiving the data round-trip time transmitted from said transmitting means; and

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retransmission request deciding means for deciding, when a lost data is detected by said loss detecting means, whether a retransmission request for the lost data is made or not based on the playback time calculated by said playback time calculating means and the data round-trip time received by said round-trip time receiving means.

20. A data communication system comprising a data transmitting apparatus and a data receiving apparatus,

wherein the data transmitting apparatus comprises:

storing means for storing a retransmittable data only;

retransmitting means for retransmitting a data that is extracted from the data stored in said storing means corresponding to a retransmission request of the data receiving apparatus;

measuring means for measuring a differential time between reception time of a first data transmitted from the data receiving apparatus and transmission time of a second data to be transmitted to the data receiving apparatus in response to the first data; and

transmitting means for transmitting the differential time measured by said measuring means included in the second data to the data receiving apparatus at a predetermined time interval, and

wherein the data receiving apparatus comprises:

calculating means for calculating a data round-trip time between the data transmitting apparatus and the data receiving apparatus by subtracting transmission time of the first data

transmitted to the data transmitting apparatus and the differential time included in the second data transmitted from the data transmitting apparatus from reception time of the second data;

5 receiving means for receiving the data transmitted from the data transmitting apparatus;

loss detecting means for detecting loss of data when the data is received by said receiving means;

10 playback time calculating means for calculating playback time of the data received by said receiving means; and

15 retransmission request deciding means for deciding, when a lost data is detected by said loss detecting means, whether a retransmission request for the lost data is made or not based on the playback time calculated by said playback time calculating means and the data round-trip time calculated by said calculating means.

20 21. The data communication system according to claim 19 or 20, further comprising priority determining means for determining, when a lost data is detected by said loss detecting means, the priority of the lost data, and wherein said retransmission request deciding means decides whether the retransmission request is made or not for the lost data which is determined by said priority determining means that the
25 priority thereof is not less than a predetermined value.

22. A data communication method in a data communication system comprising a data receiving apparatus and a data

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transmitting apparatus that retransmits a data which is extracted from the data stored in storing means for storing a retransmittable data only corresponding to a retransmission request of the data receiving apparatus, said method comprising:

a calculating step in which the data transmitting apparatus calculates a data round-trip time between the data receiving apparatus and the data transmitting apparatus;

a transmitting step in which the data transmitting apparatus transmits the data round-trip time calculated in the calculating step to the data receiving apparatus at a predetermined time interval;

a receiving step in which the data receiving apparatus receives the data transmitted from the data transmitting apparatus;

a loss detecting step in which the data receiving apparatus detects loss of data when the data is received in the receiving step;

a playback time calculating step in which the data receiving apparatus calculates playback time of the data received in the receiving step;

a round-trip time receiving step in which the data receiving apparatus receives the data round-trip time transmitted in the transmitting step; and

a retransmission request deciding step in which the data receiving apparatus decides, when a lost data is detected in the loss detecting step, whether a retransmission request for

the lost data is made or not based on the playback time calculated in the playback time calculating step and the data round-trip time received in the round-trip time receiving step.

23. A data communication method in a data communication system comprising a data receiving apparatus and a data transmitting apparatus that retransmits a data which is extracted from the data stored in storing means for storing a retransmittable data only corresponding to a retransmission request of the data receiving apparatus, said method comprising:

a measuring step in which the data transmitting apparatus measures a differential time between reception time of a first data transmitted from the data receiving apparatus and transmission time of a second data to be transmitted to the data receiving apparatus in response to the first data;

a transmitting step in which the data transmitting apparatus transmits the differential time measured in the measuring step included in the second data to the data receiving apparatus at a predetermined time interval;

a calculating step in which the data receiving apparatus calculates a data round-trip time between the data transmitting apparatus and the data receiving apparatus by subtracting transmission time of the first data transmitted to the data transmitting apparatus and the differential time included in the second data transmitted from the data transmitting apparatus from reception time of the second data;

a receiving step in which the data receiving apparatus

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receives the data transmitted from the data transmitting apparatus;

a loss detecting step in which the data receiving apparatus detects loss of data when the data is received in the receiving step;

a playback time calculating step in which the data receiving apparatus calculates playback time of the data received in the receiving step; and

a retransmission request deciding step in which the data receiving apparatus decides, when a lost data is detected in the loss detecting step, whether a retransmission request for the lost data is made or not based on the playback time calculated in the playback time calculating step and the data round-trip time calculated in the calculating step.

24. The data communication method in the data communication system according to claim 22 or 23, further comprising a priority determining step in which the data receiving apparatus determines, when a lost data is detected in the loss detecting step, the priority of the lost data, and wherein in the retransmission request deciding step it is decided whether the retransmission request is made or not for the lost data which is determined in the priority determining step that the priority thereof is not less than a predetermined value.